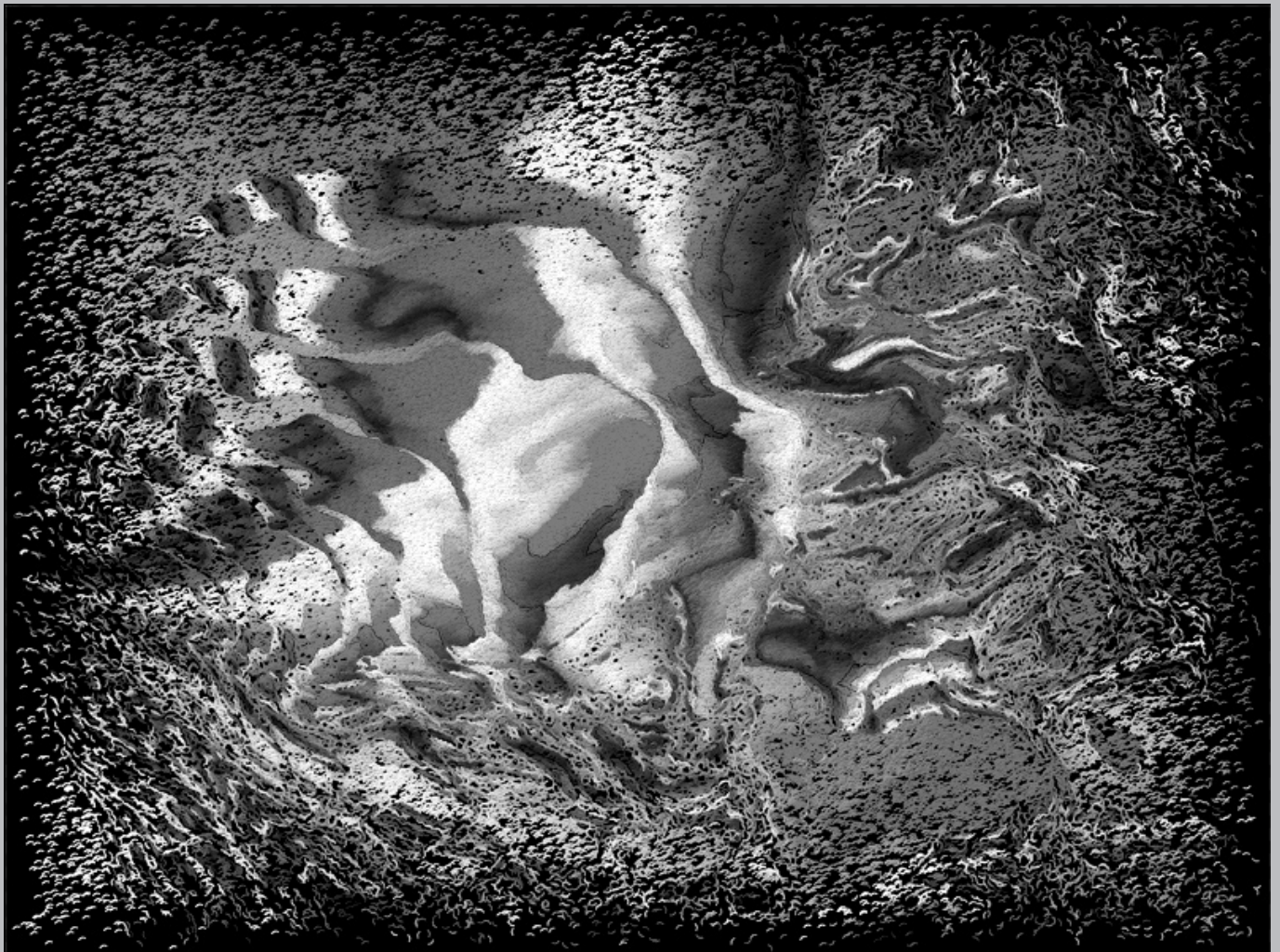


**MARK CHAVEZ
ALAIN LIORET**

March-April 2006
Volume 26, Number 4

Artificial Beings That Look Back At Us



An image analyzed with fractals and 2D filters by the beings paintings. © Alain Lioret

ISBN: 1057-2031

Artificial Beings That Look Back At Us

By Loren Means

The two articles in this issue of the YLEM Journal were produced by authors living on opposite sides of the world. Alain Lioret is an Associate Professor of Arts and Technologies of the Image within the laboratory INREV (Digital images and Virtual Reality) at Paris University. Mark Chavez is Assistant Professor for Art, Design, and Media at Nanyang Technological University in Singapore. Yet both are writing about their work with a topic dear to my heart, how artificial beings perceive us. Lioret has programmed his computer to generate artificial beings called Beings Paintings, which he then charges to evaluate works of art created by people. And Chavez has created artificial agents which interact with real people in meaningful ways. Both artists have postulated artificial consciousness that interacts with the world in dynamic ways. These are computer-based systems, so they have access to database and knowledge-based systems of vast complexity, and don't have the real-world problems inherent in robotic systems.

I found Alain Lioret's work in the Art Gallery of Siggraph's 2005 Electronic Art and Animation Catalog, in a paper titled "Being Paintings." The title turned out to be a typo: it should have been "Beings Paintings." In the paper, Lioret describes how he created works of art that were creatures using new techniques such as "cellular machines, L-Systems, genetic algorithms, neural networks..." I was impressed and awed by the paper, and by the range of Lioret's references, including not only the prominent names in Artificial Life creation (Sims, Latham, Rooke, Ventrella), but also the new star Scott Draves. Lioret even made reference to Isabel Wunsche's article in the July-August 2003 issue of the YLEM Journal. Lioret was obviously an astute observer of the modern scene. I came across an earlier article by Lioret, "Emergence of L-Cellular Morphogenesis", at www.generativeart.com/papersGA2004/3.htm, which turned out to be similar to the Siggraph article. When I contacted Lioret by email and asked him for the piece included herein, he responded with "I will be very happy to publish a paper in your journal, because I love YLEM." You've got to love a response like that.

I found Mark Chavez' article through the good offices of Anna Ursyn. Ursyn is a prominent digital artist who is featured at Siggraph art shows, and who teaches in the Department of Visual Arts at the University of Northern Colorado in Greeley. Ursyn has guest edited several issues of the YLEM Journal, including Vol. 22 #10 (2002) [Art and Programming], Vol. 23 #10 (2003) [Visualizing Data Sets 1], Vol. 24 #2 (2004) [Visualizing Data Sets 2], and Vol. 25 #4 (2005) [Information Visualization], all of which are available for perusing at www.ylem.org. Ursyn is involved with an organization called D-ART, and I'm on a committee to help evaluate manuscripts and web sites for inclusion in a seminar held in London every year. I'm no good at evaluating manuscripts and proposals, since I see manuscripts as either publishable or not publishable, and if they're publishable, I publish them. The Computers and Music issue of the YLEM Journal, Vol. 25 #6 & 8, (2005) included articles by Theresa Gartland-Jones and Akio Hizume that I got from Anna Ursyn. Ursyn is a valuable resource for YLEM, and I wish I could be more useful to her.

Alain Lioret is the author of the book *Emergence of New Aesthetics of the Movement*, published by Editions Harmatan in 2004. He also participated in the exhibition "L'écume du Ciel" realized with the architect Jean-Philippe Poirée-Ville and presented for 9 months at the International Center of the Stained glass in Chartres in 2003. For this exhibition, a new type of vegetation was generated, with mutant forms, highlighted in a film in stereo.

Mark Chavez has worked with new media technologies since the 1980's. One of his earliest works, executed in 1983, has become a cultural milestone in the Deep South of the United States. Still on display, it encompasses historic leaders charging to the Glory of the Old South, projected laser light, onto the huge carvings at Stone Mountain State Park, Georgia. Chavez' UCLA Film School MFA thesis work, a laser light piece based on Mexican mythology, was shown on the side of the Federal Building in Westwood, California, during the 1984 Summer Olympics.

I find the researches and creations manifested by Lioret and Chavez to be exciting and full of possibilities. The artist has always created objects, but attempts to relate to these objects have been solipsistic and frustrating. Now artificial entities will interact with us, as other humans do, but differently, as Mark Chavez puts it, "intelligent in a way that only a machine can be." The artist will create objects that are conscious, with a sensibility different from that of the artist, but entailing the artist's sensibility as an element. This brings to fruition the implications of my favorite quote from Walter Benjamin, in "On Some Motifs in Baudelaire", (*Illuminations*, P. 188): "To perceive the aura of an object we look at means to invest it with the ability to look at us in return."

Y L E M a n n o u n c e m e n t s

YLEM had one of their proposals accepted for the ISEA Zero One festival in San Jose this summer

Julie Newdoll, Jim Pallas and Mike Mosher, three members of YLEM, artists using science and technology based in San Francisco with members all over the world, have teamed up for this Inter City project during I.S.E.A.'s The ZeroOne San Jose Festival. A key point of having the ISEA conference in San Jose in the Silicon Valley is to recognize the importance that computing and other local industries contribute to contemporary artists. The history of this location and the people that paved the way for others should be included somewhere in the artwork and presentations. Not many people even in this area would probably recognize the faces of the pioneers of transistors and semiconductors. The Valley of Heart's Delight was Silicon Valley's original name, changed because of the importance of this industry. We present here a way to engage the city residents in learning a bit about their history and its link to the artists of ISEA.

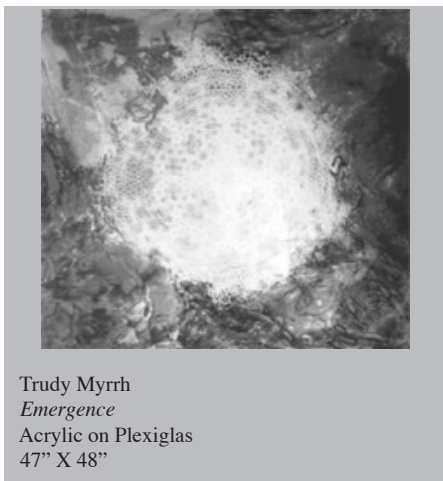
The activity of making full-size wooden cutouts of people and sending them "hitch hiking" was originally conceived by Jim Pallas in 1981. His first cutout was abandoned on a Michigan country road with a note requesting that it be delivered to an art gallery in time for a party. This was his way of delivering his artwork to the gallery for an exhibit. To his delight, the cutout made the hundred mile trip to the gallery by hitching a ride with a passer-by who was curious about the event. This willingness to give a stranger a ride may be lost in our current society, but we are going to try the technique in the Silicon Valley.



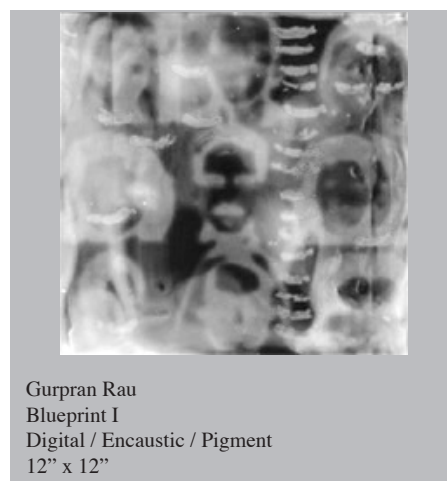
One frustration with the original hitch hiker concept was that Pallas rarely knew the whereabouts of his cutout after he abandoned it. Many have not been seen since they were set out on the road. We hope to remedy this and follow their path by putting a GPS device* inside the cutout. A GPS device can send tracking information to a web page. The real-time location of the five "hitch hikers" will be part of a computer installation art work by Michael Mosher. Mosher will provide a subjective interactive artistico-narrative on the several notable Silicon Valley "hitchhikers" whom Newdoll has set out to be picked up by passers-by alongside the area highways. The pioneers' historical importance to the region and tech industry grapples with their often curious, contradictory biographies will be part of the display. Web pages with the whereabouts of each cutout will be featured on the display. The display itself will be encased in a hand painted housing inspired by the subject matter of the project.

WORKS proposal turns into a show at The Tech in San Jose

YLEM founder Trudy Myrrh and member Gurpran Rau were selected out of the artists that were collected for the Works proposal for a show in July and August. Show dates, June 27 - August 28. Reception June 15 from 2:30 - 4:30 at The Tech in San Jose. Julie would like to thank all YLEM artists for submitting their work for the Works proposal. She is still trying to locate a venue for a larger number of artists, perhaps at Works with a reworked proposal. After getting comments from Works, she reorganized the material and submitted all the artists to The Tech. From this group of artists, Trudy and Gurpran were selected for a show. Congratulations Trudy and Gurpran!



Trudy Myrrh
Emergence
Acrylic on Plexiglas
47" X 48"



Gurpran Rau
Blueprint I
Digital / Encaustic / Pigment
12" x 12"

Myrrh paints on round sheets of clear Plexiglas with translucent colors, which are often hung in windows like stained glass. Also in the show are science-related batiks Myrrh did in the late 1970s. Gurpran Rau, a mixed-media and digital artist from Santa Monica, shows mixed-media works that combine digital print, pigment, collage and encaustic (wax). Genetic codes and forms such as circles, knots and spirals represent hidden codes, complex structures, and histories that lie just beneath the surface of our skin.

Creative Adaptive Design: Intelligence in Dynamic 3-D Characters

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School of Art, Design and Media



Figure 1. Work Shown at The 2005 Second Beijing International New Media Arts Exhibition and Symposium

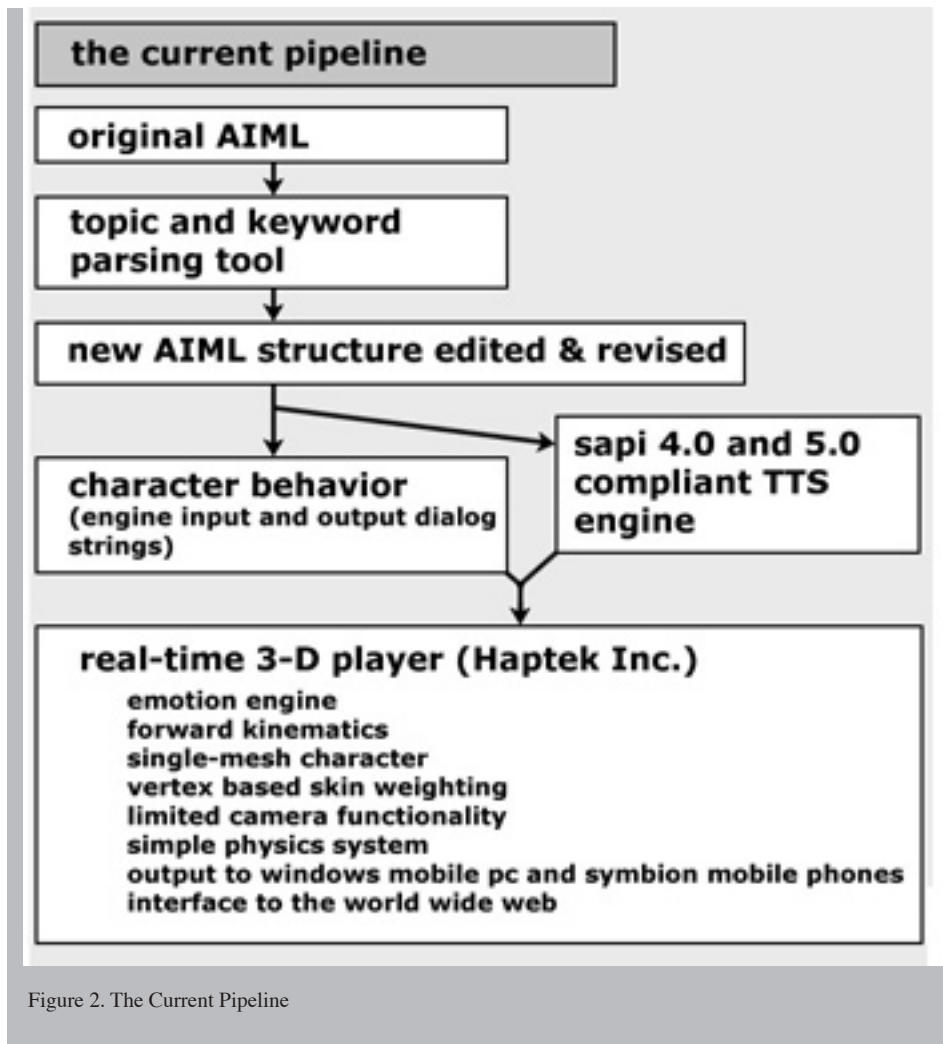
1. Introduction

The challenge of creating artifacts that adapt according to the interaction of the viewer, changing the emotive quality of the design as the human interacting with it changes in detectable emotive response, is the aim of this research. Focusing on the interplay between the user, interaction and design; and seeking to develop agents that have an innate, though, artificial, intelligence that is closely related to their visual design, is also primary. The result being the creation of a contemporary set of artifacts in the form of virtual 3-D characterizations that have an innate, though simulated, intelligence, an interactive ability that is contained by design parameters, and dynamic environments suited to the function of the artifact. Extensive research has been explored involving Agency Theory[4]. Research already undertaken has involved belief, desire and intention studies (BDI) involving human characteristics in agents[3]. A formalism has been postulated based on a branching model of time, in which belief, desire and intention-accessible worlds are themselves branching time structures[1].

The purpose of this research is not to revise these Agency Theories, but to implement them into contemporary artifacts; e.g., 3-D characters in dynamic environmental designs. These spaces as such are virtual environments where the agent therein detects and interacts with the human, viewing it in a way that is emergent upon the interaction that the human initiates. This is initially set up as a conversational game. (See Figure 1)

2. Current Research

In the process of creating an intelligent real-time 3d artificial agent for live interface from interaction via the internet, certain problems focused around the agent's physical design and personal affability become evident. These problems persist alongside other problems related to technology; in particular, using design to coax the user to easily download and install the 3-D player software; along with these marketing and technical issues creating a dynamic method to handle the way the agent responds to the content that is being discussed must be addressed.



The agent or virtual character must be able to respond to the user in a way that suggests emotive response that is congruent with topics discussed in the conversation. The agent must have a wide range of topical and current issues available within its database to draw upon during a conversation. Tackling problems like the character's ability to speak in multiple languages and cultural contexts also must be addressed. This would make the characters more accessible. The primary goal is to make agents that have a familiarity and charm that the visitor to the site is readily accustomed to seeing. In the current pipeline used for conversational agents the design is limited to 3d characters (see Figure 2). In this existing structure the characters are accessible via the internet and have interactions with people on a world wide-basis. The content of their discourse is recorded in a log file. The file is then checked for content and topic relevance in relation to the character's design. These topics are determined by interactions with the user. Changes are made to both and uploaded for further refinement.

2.1. Artificial Comedy

The content of this phase of my work consists of the creation of detailed 3d characters that are interfaced with artificial intelligence and brought to life via animation synthesis techniques. Designed with current popular motifs in mind, the focus is in the interplay between simulated and real. Having created the character Nadia (see Figure 3) for view on the internet in Windows XP-based browsers (best if viewed with Internet Explorer) the character has interacted with tens of thousands of people in the past half year on the site <http://CLONE3D.com>. The current display is a stand-alone version that does not require internet access. The work attempts to define artificial personalities in cyberspace, contrasting them with the intelligence of the person viewing the piece. Given the particular interaction, the character will provide information or chide the user with witticisms. The content also includes prerecorded audio in the form of automatically lip-synced vocalizations. In terms of design, the agent's forms are modeled in a non-photo-realistic, stylized manner. By doing so, the normal tendency to associate the characters/agents with bizarre monstrous creations is avoided; e.g., The Uncanny Valley Effect.[2] The lighting models are relatively naturalistic and use standard lighting techniques. The behavioral models are designed to emulate human gestures; however, they are stylized to reflect animation conventions. The primary goal in favoring this design style is to bring the audience into friendly discourse with the characters.



Figure 3. Virtual Girl

3. Goals and Methods

Focusing on virtual characters, the interaction that a user has with the agent is captured in the form of a dialog-based log file. (See Figure 4) This file is then analyzed and evaluated in terms of content explored and requests made by the user. The results are applied to the design and actions of the character, developing the 3d character's spontaneous animated response in a way that coincides with the given discourse. Having concentrated on creating a conversational 3D avatar-based character, the focus has been on setting up a character whose visual narrative fits its cognitive design. Here is a list of elements that have been addressed:

- An animation synthesis technique is in place allowing the animation to be created from numerous randomly interweaving cycles
- Motion derived from key-framed animation and motion capture with the ability to blend the two, an animation synthesis technique is in place
- A straightforward automated lip-sync and TTS speech methodology is working via analyzed audio files and Sapi4.0 and Sapi5.0 as well as Sapi5.0-compliant TTS technologies
- A method to extract, edit and organize a knowledge base from existing AIML databases has been created
- Output to Mobile PC and Symbian mobile phone platforms is in place
- The ability to analyze data from the interaction of the characters with clients via the world wide web is in place

4. Future Directions

Living in Singapore and pursuing artistic academic research at technological a university provides a unique opportunity to achieve dynamically-adaptive intelligent artifacts that are developed and fully functional. Although my current work focuses on characters, alongside of this development, I plan to devise methods to create imagery that reacts to emotive changes that a human undergoes during the interactivity session. This kind of tool set will initially focus on background sets and expanded character emotive reactions. Another venue for this technology is in real-world artifacts; bringing the virtual into the physical. These items could range from toys to practical objects.

Ultimately it would be interesting to explore these techniques in non-objective, reactive spaces such as a multi-panel or immersive gallery setting that would involve expanding from characters to abstractions of design and audio. This would involve creating scene templates that flavor the experience as per the concept of the work. It would also involve methods to detect the human interfacing with it, such as motion and audio sensing.

Moving forward from this approach would be creating methods to manipulate the human viewing the piece with emotive suggestions and haptic interfaces; thereby suggesting a visual and auditory solution that would steer the content of the artwork to a place that would be interesting to explore. In the case of conversational, avatar-based artificial intelligence, with the focus on visual and cognitive design, the following issues must be addressed:

Train

[04/15/2006 09:15:47 PM - [12.171.162.13](#)]

Human: The only people I can talk to are strippers

Nadia: Oh those people.

Train

[04/15/2006 09:15:55 PM - [12.171.162.13](#)]

Human: and hookers

Nadia: Between two evils, I always choose the one I never tried before.

Train

[04/15/2006 09:16:35 PM - [12.171.162.13](#)]

Human: The general outcasts.

Nadia: I have never heard about it.

Train

[04/15/2006 09:21:27 PM - [12.171.162.13](#)]

Human: I myself, am an abnormal creature

Nadia: What is abnormal creature, your job?

Train

[04/15/2006 09:21:56 PM - [12.171.162.13](#)]

Human: I am a nocturnal person

Nadia: Actually I don't meet many nocturnal people.

Train

[04/15/2006 09:22:24 PM - [12.171.162.13](#)]

Human: Plus my taciturn manner, and my not so sweet temper

Nadia: Where did you get your taciturn manner and your not so sweet temper?

Train

[04/15/2006 09:22:52 PM - [12.171.162.13](#)]

Human: I just grew up that way.

Nadia: I don't believe you..

Train

[04/15/2006 09:23:21 PM - [12.171.162.13](#)]

Human: I ha an uncle that was extremely rough on me and my siblings.

Nadia: Is that normal?.

Train

[04/15/2006 09:23:26 PM - [12.171.162.13](#)]

Human: No

Nadia: Eeew.

Train

[04/15/2006 09:23:47 PM - [12.171.162.13](#)]

Human: So when I was 13 I shot him in his sleep

Nadia: That experience must have made quite an impression on you.

Figure 4. Sample Log File

- Methods to embed and exploit conversational and behavioral artificial intelligence in art objects and artistic installations
- Dynamic design-sensitive methods to handle the way the agent responds to a given content, suggesting a contextual emotive response within the artwork; e.g., audio, color, geometric and volumetric changes
- A shared topic-sensitive database that draws upon data gathered by other agents in the field
- The agent's culturally-sensitive communication skills
- Real-time, hyper-real and stylized design libraries; how the agent's appearance relates to the response and query database
- Methods that explore unique venues and methods for gathering data through interaction
- Detection techniques for identifying the human emotive response to the artwork

5. Conclusion

Because of certain market forces, the design inherent to computer-generated characters supports the repetition and emulation of particular archetypes. These archetypes appeal to a spectrum of people who gravitate toward the hosting media; e.g., feature animated films with redundant hero types clad in motif-specific design; video games with sexually potent male and female characters. These characters are mostly one-dimensional. This project explores this archetype and expands it by creating characters that, though hyper-real, are also intelligent in a way that only a machine can be. This is part of the challenge of creating a noncommercial, intelligent emotive character. I am also led to consider, as part of the artist's craft, the visual and the technological design. Both are integral to the work; where one suggests, the other must deliver. From any stimulus that a character might receive from a Human-Computer Interface, a visual must follow or precede, creating a kind of sociological dance that involves the human with the virtual character. Therein lies the challenge of working with and expanding this medium. (See Figure 5)

5.1. Theme: The HCI Experience

This is a computer-generated pseudo/theatrical event, responsive to random nonverbal and verbal input. The result being: a meta-narrative that dissolves the idea of intimate discourse; providing a spontaneous ability to shift from spectator to creator; looking beyond questions such as archetypal adventures and interactivity in real-time games to a more immanent notion of discourse as gesture. This is based on the formation of experience and subjectivity that results as a reaction to interactivity of artificial intelligence within a contextual field.

Given the example of two characters interacting with each other and the user, (see Figure 6) the limitations of the conversational artificial intelligence becomes strongly evident in that these character's ability to make interesting conversation is highly limited. Expanding discourse will come from a large database of responses to draw upon and programming that supports interesting combinations of contextual topics. This is an ongoing aspect of the project that will be supported with higher resolution graphics, better models and movement.

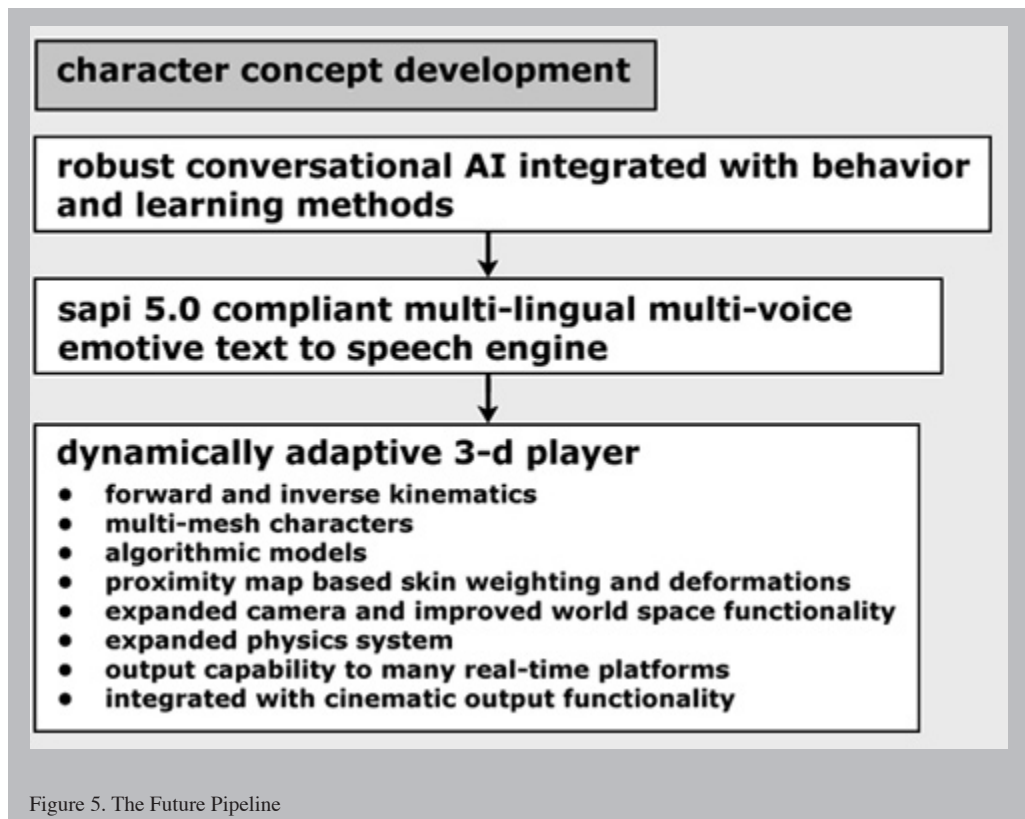




Figure 6. Two Online Characters have a Chat

5.2. Theuth the Inventor

One of the long-running issues regarding innovations and particularly cogent to this research comes from *Phaedrus*, where Socrates tells us a story:

“They say that there dwelt at Naucratis in Egypt one of the old gods of that country, to whom the bird they call Ibis was sacred, and the name of the god himself was Theuth. Among his inventions were number and calculation... and, above all, writing... To [the king, Thamus] came Theuth and exhibited his inventions... when it came to writing Theuth declared: ‘There is an accomplishment, my lord, the kind, which will improve both the wisdom and the memory of the Egyptians. I have discovered a sure receipt for memory and wisdom.’ ‘Theuth, my paragon of inventors,’ replied the king, ‘the discoverer of an art is not the best judge of the good or harm which will accrue to those who practice it... Those who acquire [writing] will cease to exercise their memory and become forgetful... What you have discovered is a receipt for recollection, not for memory’...” (Phaedrus, 95-96)

Acknowledgments

Special thanks goes to Richard Wallace and the ALICE Foundation’s A.L.I.C.E. (Artificial Linguistic Internet Computer Entity) AIML software, an award-winning Open Source Natural Language Artificial Intelligence chat robot.(<http://www.alicebot.org/>)
Special thanks to Jack Wiley and Chris Shaw of Haptek Inc. for use of their Generation 4 Player and Automated Personalities Tool Set. (<http://www.haptek.com/>)

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Past Images of the Future

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What do the images coming from painting, photography and the cinema, to quote only the most known techniques, have in common? They all are of images which are fixed on supports, and which describe last moments. Painting solidified a still life or a landscape; the photographer captured an image of an animal in action, from one strong moment of sport; the scenario writer assembled a film which captures sights from the previous months. All these moments are passed (within the meaning of our time, such as we live it as humans). But, they produce images of the past (more or less near).

1 From past to present

Of course, many scenario writers of films of science fiction propose to us that the films take place in 100 years, or a thousand years, in the future. Whatever the date on which the action of film proceeds, we look at images which are fixed on a film: they are thus recorded images, in the previous months for the diffusion of film, even if the subject is futuristic: their contents are future, but their form, their structure, has passed. However, many artists have tried to play with time. Among the most famous examples, it is significant



Figure 1: Nude Descending a Staircase. Marcel Duchamp

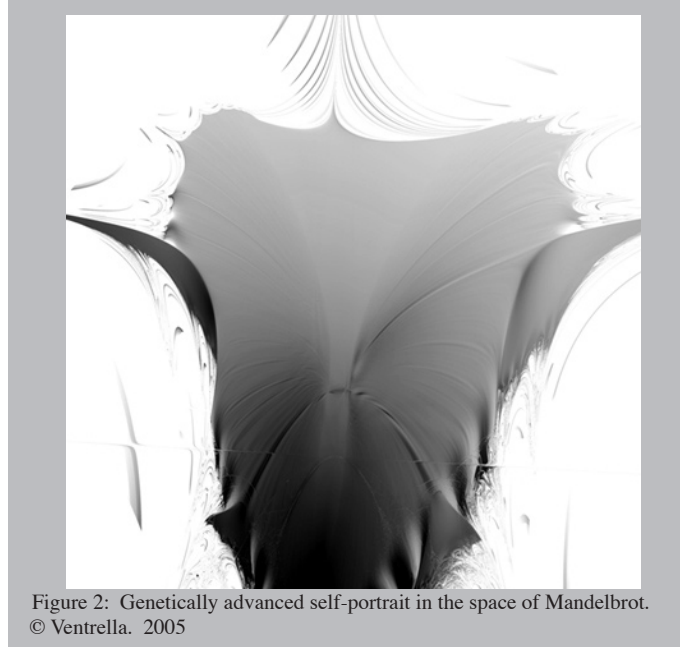
to quote the Cubist movement, and certain famous fabrics of Picasso, where one sees on the same painting several views of the same character, at various moments of its action. In another style, Marcel Duchamp endeavours to represent on only one painting simultaneous images of the figures moving, like his “Nude Descending a Staircase” (see figure 1). The most extreme examples in this direction are manifested by Italian Futurism, which tests many techniques to represent time in photographs, paintings and other works of art. But it was necessary to await new ways of creation and mainly the arrival of the computer to generate images in real time, through interactive performances. Of course the painter whom one watches carrying out his work is also “in real time”, just as the artists who use video in a direct way. But it is with the advent of the 3d real time, and the virtual ballades in the medium of fictitious worlds, that the production of images at the present really takes its rise: it is the era of interactivity in all its splendour, where the witness can interact with the work of the artist, to walk there, and even to modify certain aspects.

2 Artificial life and its clocks

And then the first works related to artificial life made their appearance. Using evolutionary techniques to make/evolve/move creatures in their environments, these works put us in front of new worlds, populated by strange creatures, which have some kind of life. Among the strong currents having explored this type of technique, the artists that Mitchell Whitelaw [16] calls “breeders of art”, or “breeders of images” (or of sounds, etc), are William Latham [1], Karl Sims [2], Steven Rooke [3], Penousal Machado, Jeffrey Ventrella, Driessens and Verstappen [7], etc (see figure 2). These artists use genetics to make/evolve/move worlds of images and creations. They are the precursors of the artists who straightforwardly will create worlds of artificial life, letting evolve/move their

works with the wire of time, the time of a performance, an exposure, or even uninterrupted time by using the Internet network. We could study many characteristics of the creation of such worlds and creatures, but one aspect of it is often neglected: the aspect of time. Indeed, at the moment when these creatures are generated, a certain amount of time elapses, which is measurable by a clock in the computer. In theory, this clock is supposed to follow our time, which we will name “human time”, but the computer clock goes beyond this. The clock of the computer can be modified by a data-processing program which has the capacity to advance time, to move it back, slow it down, or accelerate it. We can with ease travel in the time of our computers, simply by changing the date of the system or by accelerating the rate of the clock: the future of the virtual worlds that we create is thus easily visible! The creations based on artificial life thus are images which can belong to their own future, and it is undoubtedly the first time that this occurs in the history of Art...

3 To play with time



It is not difficult to understand that while advancing the clock of a computer, one can go “to see” an image of the future (if one considers the time measured by the computer as the principal scale of measurement of time for beings which exist only in the computer). For example, an image which would consist in plotting a curve of a $F(t)$ function where t represents the life time of the image (for example: $f(x) = 2^x$), can be seen with its starting point, in real time at the time present, but also, suddenly in its future, simply while advancing artificially t , measurement of the internal time of the computer. Not really very revolutionary, certainly. But, this becomes definitely more interesting when one uses the techniques of evolutionary programming. If it is supposed that one make/evolve/move an artistic work on the basis of a genetic algorithm, one in the same way can journey outward to see what will occur for the future generations from these worlds, and to go to explore the evolutions of these worlds in a thousand years or more. Of course, it is necessary for that to have a certain computing power: but nothing stops a technician who can simply use networked computers to, for example, calculate twice as quickly the evolution of a virtual world (with 2 computers) or 20 times or even a million times, with a coupled use with the Internet network! This concept is not easily conceivable for our human brain, but after all, it is not more astonishing than the concepts of the curve of the space time [17] which controls us: also we decided to explore evolutionary creations of the future, this in order to seek to open new tracks to discover how to produce images of the future.

4 Evolutionary creations

The artists or the scientists who create virtual worlds pass most of their time exploring and studying these worlds, with our own clock of time, and also our own knowledge of the world. We endeavour here to reverse this exactly! Indeed, since we create virtual beings, which have a certain degree of intelligence (at least of behavioral action) and a certain way of behaving in their virtual world, it appears interesting to see our quite real world, the virtual world, which we created. We will take as example the world of the “beings paintings”, presented by the author at Siggraph 2005 (see figure 3). They are beings whose body is composed of virtual pigments and whose principal occupation is to organize itself in a 3D space to generate images. They are thus able to be driven, and to colour multiple ways, according to various parameters, according to evolutionary methods. The artist could then visually choose parts of the world of the “beings paintings” which were most pleasing and inspiring. But here, we propose to study the reactions of these beings in front of a series of images that we propose to them: photographs, drawings, paintings of great Masters and even of the real image time in video with the use of the Webcam. The method of creation will be found extremely moving: we not look to the “being paintings” to organize to create images. We will try to see how virtual beings can react to our world, how they can create, by looking at us.

5 Attention, these images look at us!

The choice “to see” the world as that of the virtual beings that we create is far from easy. Indeed, it will be necessary in this case to try to include/understand how these beings can perceive our world. And a priori, they are far from perceiving it as one can think it. They do not have, for example, any notion of the objects of our environment: they do not know what a chair is, or a body, a face, nor even a flower. When one presents an image or a video to them, they “see” just a juxtaposition of pixels, an arrangement of colors, of which they will be able to analyze the composition. Indeed, these beings are data-processing creatures. They cannot know a priori what an image with our direction represents: on the other hand, they can try “to include/understand” an image with the tools they have. It is there that the concept becomes interesting: the only tools which one can allot to this type of beings are generative tools, functioning on the basis of parameters. It can be a question of software: of creation of fractals, cellular machines, L-systems, data-processing languages (3d for example), of tools for generation of images by genetic algorithms, networks of neurons, filters of images, etc. Thanks to this type of tools, the “beings paintings” can try “to include/understand” the images that one proposes to them by analyzing them, and while trying to reproduce them more or less perfectly. At this stage, they do not seem advanced enough to show us the great mysteries of the universe. But, they can try to analyze our images by using genetic algorithms to produce data-processing generations of images, whose aptitude can be measured by a resemblance to what they “see”. (see figure 4).

6 Genetic analysis of images



Figure 3: Vision on the world of the “beings paintings”. © Alain Lioret

Our “beings paintings” can thus use software to try to analyze our world. These are tools which can be launched automatically. This principle is very open, and one can provide them a list of tools which they can use. Here is a small example:

- Ultra Fractal
- XenoDream
- Mcell
- Visions of Chaos
- Filtres Gimp
- Apophysis [6]
- PovRay
- Kandid (see figure 5)
- MEL Maya
- Mathematica [5]

As one can see, this small list is very open, and non-exhaustive. In fact, software able to produce an image has an integrated language, which makes it possible to describe a process of creation of images. These can be used in the total diagram of analysis of images of the virtual beings. One of the only ways for these beings to try “to include/understand” our world is to compare their creations with our images, pixel by pixel (they do not have a priori a sense of organization in lines, circles, etc, but they can “learn” that if one educates them in this direction). It should be noted that this method takes as a starting point the work of Jeffrey Ventrella, which used this kind of technique to create self-portraits in space using the fractals of Mandelbrot. The aptitude of the virtual beings to include/understand our world can thus be simply measured by adding the errors on each pixel with an image that one presents to them. $Fitness = \sum 1, N e(xy)$. Where $e(xy)$ represents the difference in color of the pixel of coordinates xy between the real image and the image generated by the “beings paintings”.



Figure 4: an image analyzed with fractals and 2D filters by the beings paintings. © Alain Lioret

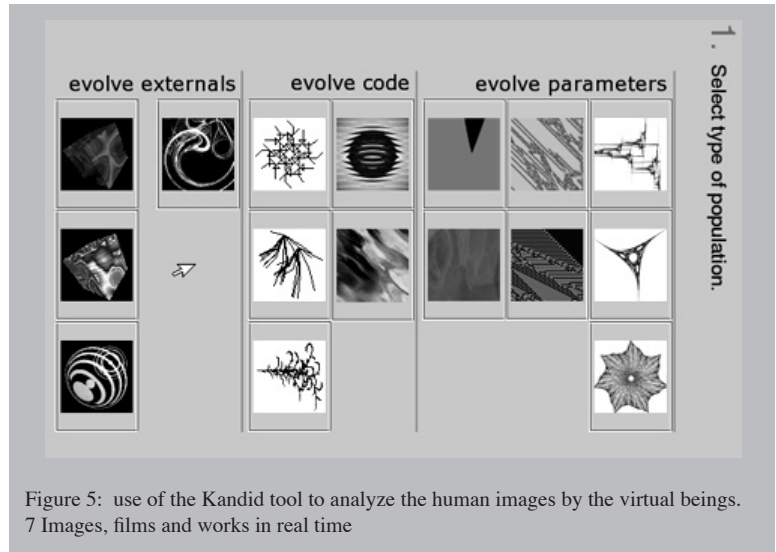


Figure 5: use of the Kandid tool to analyze the human images by the virtual beings. 7 Images, films and works in real time

The general outline of creation of these beings is simple: one or more images of our world are presented to them (photography, video, painting, etc). They then will try to produce populations of judicious generative images to resemble the model suggested: in that, they are comparable with our artists who will try to reproduce a landscape or a still life on a fabric: but their tools are very different. With genetic algorithms which measure the differences in images, they try to reproduce their model as well as possible. At this stage, it is significant to distinguish two types of very different tools: the tools which generate an image solidified in time (like a raytracing in PovRay language) and the tools which generate an evolutionary image according to rules (cellular L-systems or especially automatas). The first category of tools is often useful to implement to manage to produce more realistic images, but hardly allows playing with the internal clocks of the creatures. The second category, on the other hand, is much more interesting, since by providing rules of construction of the images, which are closely related to the process of generation in time, it makes it possible to make/evolve/move the images according to the “age” of their birth, to their future. That one can plan to study “our future”, is seen here by the beings of a virtual world. Let us take a simple example, (drawn from Mcell, software of cellular automata [8]). Let us suppose that a “being painting” produces image 6. This image is the result of a process of a cellular automata visualized at one moment T, starting from complex rules. These rules can thus make it possible to generate the future of this image, simply by continuously generating the cellular automata.

This very general process of creation will enable us to create fixed images, of course, but also some works in real time, perpetual genetic evolution, and even quite simply astonishing films, to generate virtual beings having their own design of the world. We thus carried out the film “Galateia 2005” with this methodology, while presenting to a group of “beings paintings” a series of fixed images, which were used here as a storyboard for the creation of the film. The realization of the images is very complex here, and includes/understands several layers of images, realized with very diverse tools (population of the drawn software tools randomly realized). The movements of pixels from one key image to another were analyzed according to the same processes by the virtual beings which translated and analyzed movements of pixels produced by a parallel video capture. Moreover, each time that a cellular automata was implemented in the design of a key image, the preceding and following images (last and future) were calculated. “Galateia” thus integrates images of the future. This experimental film is a good example of evolutionary creation.

8 The first experiments of creations of images of the future

It will be understood well that the evolutionary techniques of creation of images are interesting in more than one way. However, our attention is definitely held here by the possibility of exploring the future, even our future, and this for the first time in the history of art. Thus, the use of WebCam in real time can make it possible for the “beings paintings” to collect our world on line, to analyze it in their way, with their tools, and to deduce their evolutionary rules from them. These rules make it possible to generate images close to what one can show them, and to deduce from it their past and especially their future! And it is indeed our future, seen by virtual artists, but our future nevertheless.

9 About the beings paintings

The “beings paintings” themselves can be created in multiple ways. We mainly used the simulator of Artificial Life Framsticks [9] to generate the beings paintings, but we also made tests with other environments, in particular Breve. As we explained in preceding work [11,12,13], our beings paintings have only one objective in the Life: to organize to produce images. Previously, the produced images were chosen by the user. With this new work, the images carried out try to resemble the models that one proposes to them.

The visual analogies can be done at various levels, color, or with a simplification black, and white. One can even use certain filters (for example detection of contours) to facilitate the work of “imitation” [10]. Each “being painting” belonging to the population of the creative beings thus will analyze us with his way, with the generation of populations of solutions, which will utilize various tools 2d or 3d, free or commercial, according to those which are available. It is thus simulated genetics on a double level, which is implemented, with evolutionary populations of “creatures painters” which generate solutions of combinations of the process of creation of images.

10 Applications and perspectives

The techniques implemented here can be compared with reverse engineering. In addition to the artistic creation seen under the eye of other worlds (but also with their systems of thoughts, their means and tools), one can make use of it for many graphic applications. Indeed, the method works with a large variety of tools (those having a language, methods of scripting or equivalent) and allows artists or technicians of the image to seek to generate images according to a certain configuration, with tools not intended a priori for that. The centers of interest are rather significant, because they must allow the creation of new fashions of returned images (2d and 3d), and involve the appearance of libraries of 2D filters, 3D shaders, procedural textures, etc. The installation of this type of technique in the form of plug-ins in powerful software make it possible for the creators to make/emerge new methods of creations, and to set up extremely rich but complex creative processes, so complex that it would have been impossible to implement them manually, nor to even think of it...

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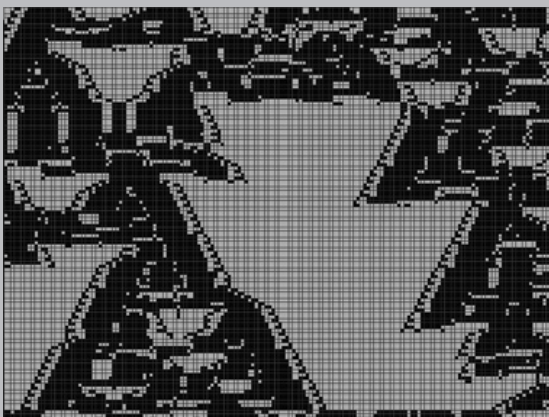


Figure 6: a creation at the moment T by cellular automata.



Figure 7: A creation of the “beings paintings”. © Alain Lioret. 2005. Extract of Galateia

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pronounced eye - lem, 1. Greek: for the exploding mass from which the universe emerged
- the material of the universe prior to creation

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